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1 [Progress in Picture Processing: 1969--71](#)

Azriel Rosenfeld

 June 1973 **ACM Computing Surveys (CSUR)**, Volume 5 Issue 2

 Full text available: [pdf\(2.34 MB\)](#)

 Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)


2 [Model-based motion estimation for synthetic animations](#)

Maneesh Agrawala, Andrew C. Beers, Navin Chaddha

 January 1995 **Proceedings of the third ACM international conference on Multimedia**

 Full text available: [html\(71.20 KB\)](#)

 Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)


3 [Skinning: Multi-weight enveloping: least-squares approximation techniques for skin animation](#)

Xiaohuan Corina Wang, Cary Phillips

 July 2002 **Proceedings of the 2002 ACM SIGGRAPH/Eurographics symposium on Computer animation**

 Full text available: [pdf\(7.73 MB\)](#)

 Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


We present a process called *multi-weight enveloping* for deforming the skin geometry of the body of a digital creature around its skeleton. It is based on a deformation equation whose coefficients we compute using a statistical fit to an input *training exercise*. In this input, the skeleton and the skin move together, by arbitrary external means, through a range of motion representative of what the creature is expected to achieve in practice. The input can also come from existing pie ...

Keywords: enveloping, skinning, surface deformation

4 [Facial animation & hair: Vision-based control of 3D facial animation](#)

Jin-xiang Chai, Jing Xiao, Jessica Hodgins

 July 2003 **Proceedings of the 2003 ACM SIGGRAPH/Eurographics Symposium on Computer Animation**

 Full text available: [pdf\(12.59 MB\)](#)

 Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


Controlling and animating the facial expression of a computer-generated 3D character is a difficult problem because the face has many degrees of freedom while most available input devices have few. In this paper, we show that a rich set of lifelike facial actions can be created from a preprocessed motion capture database and that a user can control these actions by acting out the desired motions in front of a video camera. We develop a real-time facial tracking system to extract a small set of a ...

5 30 years of research in animal breeding: APL versus Matlab and Fortran

Marcos Rico, Manuel Baselga

June 2002 **ACM SIGAPL APL Quote Quad , Proceedings of the 2002 conference on APL: array processing languages: lore, problems, and applications**, Volume 32 Issue 4

Full text available:  pdf(49.06 KB) Additional Information: [full citation](#), [references](#)



6 Fast animation and control of nonrigid structures

Andrew Witkin, William Welch

September 1990 **Proceedings of the 17th annual conference on Computer graphics and interactive techniques**

Full text available:  pdf(2.87 MB) Additional Information: [full citation](#), [abstract](#), [citations](#)



We describe a fast method for creating physically based animation of non-rigid objects. Rapid simulation of non-rigid behavior is based on global deformations. Constraints are used to connect non-rigid pieces to each other, forming complex models. Constraints also provide motion control, allowing model points to be moved accurately along specified trajectories. The use of deformations that are linear in the state of the system causes the constraint matrices to be constant. Pre-inver ...

Keywords: animation, constraints, simulation

7 Animating rotation with quaternion curves

Ken Shoemake

July 1985 **ACM SIGGRAPH Computer Graphics , Proceedings of the 12th annual conference on Computer graphics and interactive techniques**, Volume 19 Issue 3

Full text available:  pdf(861.56 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)



Solid bodies roll and tumble through space. In computer animation, so do cameras. The rotations of these objects are best described using a four coordinate system, quaternions, as is shown in this paper. Of all quaternions, those on the unit sphere are most suitable for animation, but the question of how to construct curves on spheres has not been much explored. This paper gives one answer by presenting a new kind of spline curve, created on a sphere, suitable for smoothly in-betweening (i.e. in ...

Keywords: Bézier curve, B-spline, animation, approximation, in-betweening, interpolation, quaternion, rotation, spherical geometry, spline

8 Empowering the interface: A seamless integration of algorithm animation into a visual programming language

Paul Carlson, Margaret Burnett, Jonathan Cadiz

May 1996 **Proceedings of the workshop on Advanced visual interfaces**

Full text available:  pdf(1.35 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)



Until now, only users of textual programming languages have enjoyed the fruits of algorithm animation. Users of visual programming languages (VPLs) have been deprived of

the unique semantic insights algorithm animation offers, insights that would foster the understanding and debugging of visual programs. To begin solving this shortcoming, we have seamlessly integrated algorithm animation capabilities into Forms/3, a declarative VPL in which evaluation is the continuous maintenance of a network o ...

9 Computational modeling for the computer animation of legged figures

Michael Girard, A. A. Maciejewski

July 1985 **ACM SIGGRAPH Computer Graphics , Proceedings of the 12th annual conference on Computer graphics and interactive techniques**, Volume 19 Issue 3

Full text available:  pdf(654.08 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Modeling techniques for animating legged figures are described which are used in the PODA animation system. PODA utilizes pseudoinverse control in order to solve the problems associated with manipulating kinematically redundant limbs. PODA builds on this capability to synthesize a kinematic model of legged locomotion which allows animators to control the complex relationships between the motion of the body of a figure and the coordination of its legs. Finally, PODA provides for the integration o ...

Keywords: computational modeling, legged locomotion, manipulators, motion control

10 Facial animation & hair: An example-based approach for facial expression cloning

Hyewon Pyun, Yejin Kim, Wonseok Chae, Hyung Woo Kang, Sung Yong Shin

July 2003 **Proceedings of the 2003 ACM SIGGRAPH/Eurographics Symposium on Computer Animation**

Full text available:  pdf(9.61 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we present a novel example-based approach for cloning facial expressions of a source model to a target model while reflecting the characteristic features of the target model in the resulting animation. Our approach comprises three major parts: key-model construction, parameterization, and expression blending. We first present an effective scheme for constructing key-models. Given a set of source example key-models and their corresponding target key-models created by animators, we ...

Keywords: example-based synthesis, facial animation, facial expression cloning, motion retargeting, scattered data interpolation

11 Realistic animation of rigid bodies

James K. Hahn

June 1988 **ACM SIGGRAPH Computer Graphics , Proceedings of the 15th annual conference on Computer graphics and interactive techniques**, Volume 22 Issue 4


Full text available:  pdf(884.32 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The theoretical background and implementation for a computer animation system to model a general class of three dimensional dynamic processes for arbitrary rigid bodies is presented. The simulation of the dynamic interaction among rigid bodies takes into account various physical characteristics such as elasticity, friction, mass, and moment of inertia to produce rolling and sliding contacts. If a set of bodies is statically unstable, the system dynamically drives it toward a stable configuration ...

Keywords: dynamics, modeling, rigid bodies, simulation

12 Lossless compression of computer generated animation frames

Hee Cheol Yun, Brian K. Guenter, Russell M. Mersereau
 October 1997 **ACM Transactions on Graphics (TOG)**, Volume 16 Issue 4

Full text available:  pdf(5.18 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This article presents a new lossless compression algorithm for computer animation image sequences. The algorithm uses transformation information available in the animation script and floating point depth and object number information at each pixel to perform highly accurate motion prediction with very low computation. The geometric data (i.e., the depth and object number) can either be computed during the original rendering process and stored with the image or computed on the fly during com ...

Keywords: compression, computer animation, computer graphics, motion prediction

13 Animation: Animating real-time realistic movements in small plants

Jason C. Wong, Amitava Datta

June 2004 **Proceedings of the 2nd international conference on Computer graphics and interactive techniques in Australasia and South East Asia**

Full text available:  pdf(673.72 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Much of the research involved in computer graphics is focused on creating realistic images and animations that mimic the world we see around us, as well as creating believable environments not from this world. Techniques for animating realistic water, smoke, fire, fog, and other natural phenomena have been extensively explored. It is only recently that powerful computer hardware has become available to achieve these realistic animations. Compared with other natural phenomena, animations of vegeta ...

Keywords: animations, foliage, modeling, real-time, small plants

14 Real-time animation and motion capture in Web human director (WHD)

Christian Babski, Daniel Thalmann

February 2000 **Proceedings of the fifth symposium on Virtual reality modeling language (Web3D-VRML)**

Full text available:  pdf(696.13 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


Motion capture systems usually work in conjunction with complex 3D applications, such as 3D Studio Max by Kinetix or Maya by Alias/Wavefront. Once models have been created in these applications, motion capture systems provide the necessary data input to animate these models. The context of this paper introduces a simple motion capture system, which is integrated into a web-based application, thus allowing HANIM humanoids to be animated using VRML and JAVA. Since Web browser/VRML plugin cont ...

Keywords: HANIM, Java, VRML, virtual humans animation

15 Animation: SnakeToonz: a semi-automatic approach to creating cel animation from video

Aseem Agarwala

June 2002 **Proceedings of the 2nd international symposium on Non-photorealistic animation and rendering**

Full text available:  pdf(639.81 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

SnakeToonz is an interactive system that allows children and others untrained in cel animation to create two-dimensional cartoons from video streams and images. The ability to create cartoons has traditionally been limited to professional animation houses and

trained artists. SnakeToonz aims to give anyone with a video camera and a computer the ability to create compelling cel animation. This is done by combining constraints of the cartooning medium with simple user input and analysis of that in ...

16 Goal-directed, dynamic animation of human walking

A. Bruderlin, T. W. Calvert

July 1989 **ACM SIGGRAPH Computer Graphics , Proceedings of the 16th annual conference on Computer graphics and interactive techniques**, Volume 23 Issue 3

Full text available:  pdf(3.05 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)



17 Modeling/simulation: Complex deformable objects in virtual reality

Young-Min Kang, Hwan-Gue Cho

November 2002 **Proceedings of the ACM symposium on Virtual reality software and technology**

Full text available:  pdf(1.94 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



In this paper, we present a real-time animation technique for deformable objects based on mass-spring models in virtual reality environments. Many researchers have proposed various techniques for representing the motion and the appearance of deformable objects. However, the animation of deformable objects in virtual reality environments is still a hard problem. One of the most intensively studied deformable objects is virtual cloth. The difficulties in cloth animation mainly lie in the fact that ...

Keywords: cloth animation, real-time animation, virtual reality

18 Trainable videorealistic speech animation

Tony Ezzat, Gadi Geiger, Tomaso Poggio

July 2002 **ACM Transactions on Graphics (TOG) , Proceedings of the 29th annual conference on Computer graphics and interactive techniques**, Volume 21 Issue 3

Full text available:  pdf(524.89 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)



We describe how to create with machine learning techniques a generative, speech animation module. A human subject is first recorded using a videocamera as he/she utters a predetermined speech corpus. After processing the corpus automatically, a visual speech module is learned from the data that is capable of synthesizing the human subject's mouth uttering entirely novel utterances that were not recorded in the original video. The synthesized utterance is re-composited onto a background sequence ...

Keywords: facial animation, facial modeling, lip synchronization, morphing, optical flow, speech synthesis

19 Animation: Ryan: rendering your animation nonlinearly projected

Patrick Coleman, Karan Singh

June 2004 **Proceedings of the 3rd international symposium on Non-photorealistic animation and rendering**

Full text available:  pdf(748.35 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



Artistic rendering is an important research area in Computer Graphics, yet relatively little attention has been paid to the projective properties of computer generated scenes. Motivated by the surreal storyboard of an animation in production---*Ryan*---this paper describes interactive techniques to control and render scenes using nonlinear projections. The paper makes three contributions. First, we present a novel approach that distorts scene

geometry such that when viewed through a standar ...

Keywords: Non-Photorealistic Rendering, local illumination, multiprojection, nonlinear perspective

20 Linear combination of transformations



Marc Alexa

July 2002 **ACM Transactions on Graphics (TOG) , Proceedings of the 29th annual conference on Computer graphics and interactive techniques**, Volume 21 Issue 3

Full text available:  pdf(2.95 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Geometric transformations are most commonly represented as square matrices in computer graphics. Following simple geometric arguments we derive a natural and geometrically meaningful definition of scalar multiples and a commutative addition of transformations based on the matrix representation, given that the matrices have no negative real eigenvalues. Together, these operations allow the linear combination of transformations. This provides the ability to create weighted combination of transform ...

Keywords: exponential map, linear space, logarithm, matrix exponential, transformations

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